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## NOTES ON NEW OR RARE MYXOMYCETES

W. C. STURGIS

(WITH PLATES 14 AND 15)

During the past few years a number of interesting species of Myxomycetes have come to my attention. They are principally the result of my own collecting, but in some cases they are gatherings submitted to me through the courtesy of other collectors. In the former case most of the gatherings were made in Colorado, and add considerably to the already rich list of Myxomycetes recorded from that locality. As usual, I am greatly indebted to the expert judgment of Miss G. Lister and Professor T. H. Macbride, to whom have been submitted the more critical specimens included in the following list.

**Physarum melanospermum** sp. nov. *Pl. 14, f. 1-3.* Plasmodium? Sporangia stalked, gregarious or scattered, turbinate or discoid, usually umbilicate above, 0.4-0.7 mm. in diameter, grayish-white, rugose; sporangium-wall membranous, roughened above with abundant deposits of white lime, darker and reddish-brown where it merges into the stalk. Stalk stout, black, furrowed, expanding below, about 0.2 mm. long and 0.1 mm. thick. Capillitium consisting of abundant rounded, elongate or angular, white lime-knots, connected by many delicate hyaline threads. Spores dark-purplish-brown, closely spinulose, showing a paler and smoother germinal area, 12.5-16  $\mu$  in diameter.

*Habitat:* On dead twigs and leaves of *Clematis*, *Symphoricarpos*, etc., Aurora, Colorado (Bethel), Colorado Springs, Colorado (Sturgis).

This species has occurred abundantly in successive years on fallen refuse under shrubby thickets. It somewhat resembles

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small forms of *Badhamia macrocarpa*, and might be mistaken at first sight for *B. orbiculata*; but the character of the capillitium is distinctly that of *Physarum*. From *P. compressum* and *P. conatum*, its nearest allies, it may be distinguished by the shape and habit of the sporangia and their small size, as well as by the larger spores with the wall of uneven thickness.

**Physarum lilacinum** Sturgis & Bilgram sp. nov. Plasmodium? Sporangia gregarious, stalked, globose, erect, pale-lilac to pale-Indian-red<sup>1</sup> in color, 0.5 mm. in diameter; sporangium-wall membranous, beset with rounded masses of lilac or reddish lime. Stalk erect, broad-based, tapering upward, calcareous, furrowed, paler than the sporangium or concolorous, 0.7–0.9 mm. long, about 0.1 mm. thick. Columella conical or columnar. Capillitium delicate, rigid, persistent; lime-knots small, rounded, composed of large, pale lilac, or reddish, spherical granules. Spores pale-brown, almost smooth, 8–9  $\mu$  in diameter.

*Habitat*: On dead wood and moss. Fairmount Park, Philadelphia, Pa. (H. Bilgram).

This peculiar form occurred in considerable abundance in September, 1910, and again two years later at a distance of twenty miles from the original locality. Like *P. citrinum*, *P. murinum* and others of this group, it resembles *P. globuliferum* very closely, except in color. Whether this affords sufficient grounds of distinction may be questionable, but since it is at present accepted as such, it seems advisable to publish the above as a distinct species rather than as a colored variety of *P. globuliferum*. From *P. pulcherrimum* it differs not only in color, but in the shape of the columella and in the color of the spores.

**PHYSARUM JAVANICUM** Racib. This species occurs in a large collection of Myxomycetes made in Florida by Professor Roland Thaxter in the autumn of 1897. The scattered, stalked, white sporangia, obconic in shape, deeply umbilicate above; the subulate, spirally-twisted, sulcate stalks encrusted with whitish lime; the capillitium of large, angular or rounded, white lime-knots, with stiff, rod-like attachments to the wall, seemed to be characters applicable only to this species. Specimens were submitted to Miss Lister, who confirmed the diagnosis. This is the first record of the occurrence of *P. javanicum* outside of Java.

<sup>1</sup> The colors are those designated as "purple madder" and "Indian red" of Winsor and Newton's "Specimen Tints."

PHYSARUM SULPHUREUM Albert. & Schw. Syn. *P. variabile* Rex. During the summer of 1914 a species of *Physarum* occurred abundantly on dead twigs and leaves in a swamp in the Wet Mountain Valley, Colorado. Some of the gatherings showed the greenish or bronze-yellow, globose or somewhat clavate sporangia, and the reddish-brown, densely calcareous stalks of *P. variabile*. Others agreed perfectly with the original description and figure of *P. sulphureum*. This led to a careful study of the two, with the result that it proved impossible to discover any essential differences between them. The points of difference noted by the Listers (Mon. Mycet., Ed. 2, pp. 46-47) emphasize the marked similarity. Macbride (N. A. Slime-Moulds, pp. 39-40) gives an admirable description of *P. variabile*—though placing it among the forms with non-calcareous stalks—but makes no mention of *P. sulphureum*. In a recent letter, Miss Lister states that in her opinion the Colorado gatherings prove the identity of the two so-called species, and at the same time she calls my attention to a minor point of similarity between them in the form of small, greenish, spherical bodies which become apparent in the wall and lime-knots, after the lime is dissolved out with acid. In the Colorado material sessile and plasmodiocarp forms frequently occur.

PHYSARUM CARNEUM List. and Stur. This rare species, first described from material collected near Colorado Springs in 1908, was found again in the Wet Mountain Valley, Colorado, in August, 1914. It is satisfactory to note that this second gathering, occurring many miles from the original locality, wholly confirms the original diagnosis in the tawny sporangia borne on delicate, buff, limeless stalks; large, branching, white lime-knots; and bright-brownish-purple, spinulose spores, paler and smoother on one side. The original gathering was on decayed wood, the later one on a dry Basidiomycetous fungus.

PHYSARUM FULVUM (Macbr.) List. This species has heretofore been represented with certainty by only the single gathering made by Mr. Bethel, of Denver, in Loveland Pass, Colorado, in 1896. This occurred on living willow at the edge of melting snow. In August, 1915, I found it growing in limited quantity on dead coniferous wood near Lake Eldora, Colorado. Notwith-

standing an exceptionally dry summer, the specimen was badly weathered, indicating that it is a typically spring species. It is, however, perfectly characteristic in the membranous hypothallus and stalk; persistent capillitium of fine, branching threads with large, scattered, yellow lime-knots; and dark, spinulose spores, 10.5–11  $\mu$  in diameter.

CRATERIUM AUREUM (Schum.) Rost. This species is recorded here merely as an addition to previously published lists of Colorado Myxomycetes. It occurred in considerable abundance on dead herbaceous refuse in the Wet Mountain Valley and on dead twigs on Cheyenne Mountain in August, 1914. Both gatherings are of the form with globose, golden-yellow sporangia, cartilaginous below; orange stalks rising from a membranous hypothallus; dense capillitium, the nearly white lime-knots often merging into a central mass; spores 8–9.5  $\mu$  in diameter. In this form it is hardly distinguishable from *Physarum citrinellum* Pk.

CRATERIUM PARAGUAYENSE (Speg.) List. Recorded hitherto in the United States only from Louisiana (*Craterium rubescens* Rex), this species occurs in fine condition in a large collection of Myxomycetes made by Professor Thaxter in Florida in 1897. The specimens were found on dead leaves at Palm Beach and are typical in every respect.

DIDERMA TREVELYANI (Grev.) Fries. The normal form of this species is common in Colorado. In September, 1915, a plasmodiocarpic form was found in company with the normal form on dead leaves on Cheyenne Mountain, Colorado. The plasmodiocarps are of very variable form and size and of a uniform chocolate color without paler lines of dehiscence. In other respects they are quite typical.

DIDERMA RUGOSUM (Rex) Macbr. Fine specimens of this rather uncommon species were collected in Florida by Professor Thaxter in 1897. It is typical in every respect, except that the spores measure 11.5–14.5  $\mu$  in diameter, a fact of interest in view of the close relationship of this species to *D. radiatum*.

DIDERMA SIMPLEX (Schroet.) List. Miss Lister reports this species from New Jersey (Monog. Mycet., p. 108); Mr. Hugo Bilgram has collected it near Philadelphia. A very fine gathering was made by Professor Thaxter at Cranberry, N. C., in

August, 1896. The latter consists of densely crowded sporangia of a tawny color nearly approaching pale-raw-umber. The wall is somewhat cartilaginous and the spores are rather larger than in typical *C. simplex*, but the general characteristics are those of that species. Many of the sporangia show a peculiar large, hollow columella, agreeing in this particular with the specimen from Bartlett Mountain, N. H., referred to in Lister's Monograph, Ed. 2, p. 108. If this latter specimen is correctly referred to *D. simplex*, that species would appear to be subject to considerable variations in color and to be fairly widely distributed throughout the United States.

*DIACHAEA CYLINDRICA* Bilgr. This species, hitherto recorded only from Philadelphia, occurs in a collection of Myxomycetes made by Professor Thaxter at Intervale, N. H., in September, 1901. In its densely crowded habit it resembles *D. caespitosa*; the sporangia are also less markedly cylindrical than in the type; but on the whole the specimen is evidently a form of *D. cylindrica* in which the almost confluent character of the sporangia is correlated with a remarkably indefinite and ill-developed columella.

*Didymium fulvum* sp. nov. *Pl. 14, f. 4-6.* Sporangia gregarious, sessile, elongate or forming curved plasmodiocarps, sometimes confluent, rarely subglobose, concave beneath, pale-raw-umber in color, 0.5-0.8 mm. in diameter, occasionally seated on a concolorous, membranous, lime-encrusted hypothallus which may form pseudo-stalks; sporangium-wall membranous, stained with yellow blotches, thickly sprinkled with clusters of large acicular crystals of pale-yellowish lime. Columella very much flattened or obsolete. Capillitium an abundant network of delicate, almost straight or flexuose, pale-purple or nearly hyaline threads, frequently with dark, calyciform thickenings as in *Mucilago*, and occasionally showing fusiform, crystalline blisters. Spores dark-purplish-brown, coarsely tuberculate, the tubercles usually arranged in curved lines, paler and smoother on one side, 12.5 to 14.5  $\mu$  in diameter.

HABITAT: On dead twigs, leaves and other refuse. Wet Mountain Valley, Colorado, August, 1913.

This peculiar form has been found only once, but in considerable abundance. At first sight it bears a very close resemblance to some form of *Lepidoderma Carestianum*, but notwithstanding



the variable character of that species it could hardly be made to include a form with stellate lime-crystals. The capillitium and spores resemble those of *Mucilago*, but it is evidently removed from that genus by its habit and structure. Among the species of *Didymium*, the only one approaching it in color appears to be *D. leoninum*, but otherwise the two forms have no features in common. On the whole, the present species appears to stand by itself in the genus *Didymium*, but with decided leanings toward *Lepidoderma*, and even toward *Mucilago*.

*ECHINOSTELIUM MINUTUM* DeBary. This species occurred on dead herbaceous stems in a laboratory culture in Professor Thaxter's laboratory at Cambridge, Mass., in December, 1914. The material came from Waverly, Mass. Although this appears to be the first record of its appearance in America, the species may not be uncommon. Its small size and its resemblance to a *Mucor* or some Hyphomycetous fungus might easily cause it to be overlooked.<sup>2</sup>

*AMAUROCHAETE FULGINOSA* (Sow.) Macbr. This species has been reported hitherto in the United States only from New England, New York, Carolina, and Ohio. In 1909, Mr. Bethel collected it on dead wood of *Pinus Murrayana* at Tolland, Colorado, thus extending its range westward.

In the Cryptogamic Herbarium of Harvard University there is a specimen from Professor Macbride marked "*Amaurochaete cribrosa* (Fr.)," collected on Mt. Rainier, Washington. It is very different from *A. fuliginosa*, consisting of a round, determinate, sooty patch of ill-developed sporangia showing weak, indefinite, membranous columellae and a capillitium composed of very delicate, more or less arcuate threads connecting angular or elongated membranous expansions, the whole forming a very open and imperfect net with many free ends. The spores are rather dark, minutely spinulose, paler and smoother on one side, and measure 12-15  $\mu$  in diameter. They are slightly larger and darker than those of *A. fuliginosa*. A precisely similar form was collected by Mr. A. P. D. Piguet at Sharon, Mass., in May, 1910, on bark of *Pinus Strobus*.

<sup>2</sup> Since writing the above, a gathering of *Echinostelium* has been reported to me by Mr. Bilgram, of Philadelphia, who found it growing in the open, in company with *Tilmadoche*.

That this is the "*Lachnobolus cribrosus*" of Fries appears to me fairly certain, and with this view both Miss Lister and Professor Macbride agree. The combination, *Amaurochaete cribrosa* (Fr.) appears never to have been published.

CRIBRARIA TENELLA Schrad. Specimens of this common species were found in December, 1898, at Palm Beach, Florida, by Professor Thaxter. They are noteworthy as being the "very small neat variety" noted by Miss Lister (Mon. Mycet., Ed. 2, p. 181) as occurring in this country and in Dominica. The variety bears a very close resemblance, except in color, to *C. microcarpa*.

CRIBRARIA VIOLACEA Rex. A rather abnormal form of this species was found by Professor Thaxter on pig-dung and on wood at Eustis and Cocanut Grove, Florida, in September and November, 1897. In both gatherings the apical portion of the sporangia consists of large polygonal, membranous fragments, connected by many very delicate threads. Only occasionally are any thickened nodes apparent.

CRIBRARIA PURPUREA Schrad. This rare species occurred in considerable abundance on coniferous wood in the Wet Mountain Valley, Colorado, in August, 1913. It was collected as *Dicthydium*, its true character appearing only upon microscopic examination. From *C. elegans* Berk. & Curt., it differs in its larger size, the surface-net with variously expanded nodes, and the minutely spinulose spores. These characters, however, are not altogether distinctive; the present gathering shows a certain blending of the two, and it is not unlikely that further gatherings of *C. elegans* may show that it is only a small form of *C. purpurea*.

**Enteridium minutum** sp. nov. Pl. 15. Plasmodium? Aethalia rounded or elongate, pulvinate, pale umber in color, seated on a broad membranous base, 1.5-2 mm. in diameter; wall wrinkled and usually marked with small, scattered pits, pale-yellow, membranous. Walls of the component sporangia membranous, minutely roughened, perforated with round openings, the margins of which show many free threads; or reduced to irregular, anastomosing strands arising from the base of the aethalium, with membranous or net-like expansions at the angles and with many delicate, free, pointed ends. Spores pale-yellow, usually united in twos or threes and ovoid or flattened on one side; when free, globose, very minutely spinulose, 9.5-10.5  $\mu$  in diameter.

HABITAT: On dead coniferous wood. Eldora Lake, Colorado, August, 1915.

It is with great hesitation that I describe this form as a new species. Miss Lister states, in correspondence, that the aethalia of *Enteridium olivaceum* are frequently very small, but the spores of that species are always olive in the mass, in sharp contrast with the yellow color seen in the form under discussion; apparently also, they are always united in large clusters. The inner structure of the aethalia of *E. minutum* is in some cases almost exactly that of typical *Enteridium*; in others it more nearly resembles the capillitium of *Liceopsis*; yet the aethalia show every indication of having developed normally to maturity. On the whole, it has seemed best to record this form now, in the event of further gatherings being made which may throw additional light upon it.

HEMITRICHIA LEIOCARPA (Cke.) List. About two years ago Mr. Bilgram of Philadelphia sent me a specimen which bore a certain resemblance to a long-stalked form of *Arcyria cinerea*. Upon closer examination, however, it proved to be *Hemitrichia leiocarpa*. It is in all respects typical and appears to differ quite markedly from *H. clavata* in color and in the small size of the spores. An interesting feature of the gathering, to which Miss Lister called my attention, is seen in the right-handed spirals on the capillitial threads; while in *H. clavata* the spirals are left-handed. Miss Lister further states, in correspondence, that in the type specimen of *H. leiocarpa* from Maine, as well as in a specimen collected by Professor Balfour in the Edinburgh Botanic Gardens, the spirals are right-handed, while in the type of *H. Varneyi* Rex, which is supposed to be identical with *H. leiocarpa*, the spirals are left-handed, as in *H. clavata*, and she suggests that the direction of the spirals may be diagnostic. In my opinion this is probably not the case. It is not unusual in the case of *Arcyria globosa*, for example, to find specimens in which the minute spines on the threads are arranged in a right-handed spiral, though normally the arrangement is left-handed, as noted by Miss Lister (*Mon. Mycet.* Ed. 2, p. 238). Such is the case in the specimen distributed by Ellis & Everhart in *N. Am. Fungi* 1116. If the spirals in *H. leiocarpa* may be either right-handed



or left-handed, the species has now been recorded from Maine, Kansas, Pennsylvania, Poland and Scotland.

*ARCYRIA OERSTEDTII* Rost. A single large gathering of this species was made in the Wet Mountain Valley, Colorado, in August, 1914. It is perfectly characteristic, though lacking the persistent remnants of the sporangium-wall. This is not a diagnostic feature. The species is recorded from New York, Pennsylvania, and Kansas. The present record extends the range westward, making it probable that it is not uncommon throughout the United States.

*ARCYRIA OCCIDENTALIS* (Macbr.) List. This rare form was found at Oquossoc, Maine, growing in company with *Trichia contorta* on poplar bark, in May, 1916. The gathering is faded and weathered, indicating that the species should be looked for early in the spring or possibly in the late autumn. The sporangia are either separate or crowded; in the former case they show fairly long stalks. The persistent portion of the wall splits downward in rounded lobes. The minutely spinulose capillitium is marked besides with a single row of small blunt teeth, arranged in a very open spiral. Though rare, the species appears to be widely distributed.

*PERICHAENA CORTICALIS* (Batsch) Rost. var. *liceoides* (Rost.) List. In looking over a collection of Myxomycetes made by Professor Thaxter in Florida in 1897, I came across a peculiar form growing on cow-dung, which, from its minute size, its delicate, membranous structure, and the complete absence of capillitium, I took to be an undescribed species of *Licea*. Specimens were submitted to Miss Lister, however, who, in reply, referred the gathering as above, stating further that in a series of specimens, all on dung, the capillitium was either absent, or in the form of irregular elaters, or even combined into a net. In the Florida specimens the sporangia are globose or pulvinate, sessile, yellow-brown, 0.14–0.29 mm. in diameter; the wall is pale-yellow, membranous, with minute granular thickenings; capillitium wanting; spores yellow, thick-walled, distinctly spinulose, 11.5–13.5  $\mu$  in diameter. This is the first recorded gathering in America.

*DIANEMA HARVEYI* Rex. This species has hitherto been repre-

sented in America only by Harvey's original gathering from Orono, Maine. It is therefore satisfactory to be able to record another locality. In August, 1913, it was collected in small quantity in the Wet Mountain Valley, Colorado. The gathering corresponds in every particular with the original description.

*DIANEMA CORTICATUM* List. A small gathering of this interesting species was made at Lake Eldora, Colorado, in August, 1915. The salmon-pink plasmodium occurred on coniferous wood and was seen to mature into subglobose or elongated, crowded sporangia, often longitudinally wrinkled and of a reddish-brown or chestnut color. The capillitial threads are scanty, delicate, straight, rarely branching, often thickened longitudinally or in a bead-like manner, rarely showing traces of spiral markings. The spores, usually united in clusters of 2-5, are, in the mass, precisely the color of those of *Lycogala epidendrum*. This is the first record of this species in the United States. Miss Lister writes me that it was collected by Professor J. W. Eastham near Quebec in September, 1913. In gross appearance and in the character of the sporangium-wall, *Dianema corticatum* recalls the genus *Perichaena*. The clustered, yellow spores are similar to those of *Enteridium*. The capillitium exhibits the features of both *Prototrichia* and *Dianema*. As Miss Lister points out, it is undoubtedly a transition form connecting the two latter genera.

281 FOURTH AVENUE,  
NEW YORK CITY.

#### EXPLANATION OF PLATES

##### PLATE 14

- Fig. 1. *Physarum melanospermum*. Habit.  $\times 15$ .  
 Fig. 2. The same. Capillitium and spores.  $\times 450$ .  
 Fig. 3. The same. Spores.  $\times 960$ .  
 Fig. 4. *Didymium fulvum*. Habit.  $\times 15$ .  
 Fig. 5. The same. Portion of sporangium-wall, with capillitium and spores.  $\times 450$ .  
 Fig. 6. The same. Spores.  $\times 960$ .

##### PLATE 15

- Fig. 1. *Enteridium minutum*. Habit.  $\times 15$ .  
 Fig. 2. The same. Portions of interior of aethalia showing varied structure of component sporangium-walls.  $\times 450$ .  
 Fig. 3. The same. Spores.  $\times 450$ .  
 Fig. 4. The same. Spores.  $\times 960$ .